Roughness vs. Thickness in Ru/C Multilayers - a Parametric Study

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Review of measurements of interface roughness in multilayer mirrors has shown a trend of increasing roughness with increasing thickness in various systems. In order to study this dependence more thoroughly in a single system, a set of multilayers was fabricated with a range of d-spacings from 15Å to 150Å by rf-sputtering in argon. The nearly-immiscible Ru/C system was chosen to eliminate as much as possible the effects of interdiffusion. To address the increase of roughness with number of layer pairs, two sets of samples were made, one with constant number of layer pairs and one with constant total thickness. Measurements of surface roughness by AFM, and of average roughness by modeling of hard x-ray reflectivity, and their dependence on thickness will be reported. Growth of roughness with number of layers and implications about the fundamental causes of roughness and contributions from the substrate will be discussed.